Computer Program for the Automated Attendance Accounting System

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The Automated Attendance Accounting System (AAAS) was developed under the auspices of the Space Technology Applications Office at JPL. The task is basically the adaptation of a small digital computer, coupled with specially developed pushbutton terminals located in school classrooms and offices for the purpose of taking daily attendance, maintaining complete attendance records, and producing partial and summary reports. Especially intended for high schools, the system will relieve both teachers and office personnel from the time-consuming and dreary task of recording and analyzing the myriad classroom attendance data collected throughout the semester. In addition, since many school district budgets are related to student attendance, the increase in accounting accuracy is expected to augment district income. A major component of this system is the real-time AAAS software system, which is described in this article.

Introduction

The Automated Attendance Accounting System (AAAS) provides the capability to report, maintain, and interrogate attendance data automatically rather than manually. Its use is intended for junior and senior high schools where a period-by-period accounting of students is desired. The system is composed of a Varian 620i mini-computer with a 4096-word (16 bits/word) memory, a Vermont drum memory with 96 tracks (184,000 words), a teletype, 96 keyboard entry terminals, multiplexer and data buffer interface assembly, and the AAAS software. The 96 keyboard entry terminals are located in the classrooms, attendance office, and certain administrative offices. Each of these terminals has keys numbered 0 to 9 to record student numbers, plus buttons to signal absentees, tardinesses, error corrections, and emergency calls. Each student is assigned a unique four-digit identification number and is allocated a vital statistic and data file on a quick retrieval memory device. In this way, an up-to-date and recallable record of each student is available, as well as class rosters, class reports, and daily and monthly summaries.

The software capabilities fall into four general categories: interrupt processing, period processing, daily processing, and request processing. The program consists of approximately 8000 instructions with the interrupt processors and period processors residing in core continuously. The daily processors and request processors reside on drum and are loaded into core when needed by a set of overlay programs. This overlay procedure enables the program to greatly exceed available primary computer memory.

Attendance reporting is done by the teacher on a terminal in the classroom. This information is sent to the computer from the terminal. The data is then processed, stored on the drum, and displayed on the printer to be used by the attendance accounting office and the school administration.

Interrupt Processing

Interrupt processing refers to a hardware mechanism that temporarily suspends computational activity by the computer in order to receive and process events externally generated. Usually such interrupts are short in nature, and the system is designed to minimize the extent of computational perturbation. The clock, teletype operation, and classroom terminal inputs are processed on an interrupt basis. The clock interrupts are used to maintain the time of day in 4-s increments. Both the input and the output on the teletype are processed by interrupts. Once an output line is started, the computer resumes normal processing with the output being typed as the teletype is available. Classroom inputs consist of an event key generally preceded by a four-digit (student or teacher) identifier. The interrupt processor stores the classroom inputs into tables ordered by device number. One table holds the event input while a parallel table holds the four identifier digits (if more than four digits are input, only the last four are retained). The tables are processed in normal, non-interruptive, computational manner. If the input was acceptable, the feedback light is turned on for the terminal from which the input came. The response time is normally less than 1 s, but in extreme cases it could be as high as 3 s. The one exception to this processing is the emergency event. As soon as an emergency event is input, a message giving the location of the terminal is immediately output at the teletype.

Period Processing

During each period of the day, the software will accept attendance reporting from any terminal which has been activated by the input of a legitimate teacher key. Attendance input consists of a four-digit student identifier followed by an absence, tardy, or error event. The software updates the student master file from these inputs and produces the following output.

(1) At 8 min after period start time: an alphabetized list of absent students and an alphabetized list of tardy students.

(2) At 30 min after period start time: a list of returnees (except first period) and a list of returnees on probation (first period only).

(3) At 45 min after period start time: an alphabetized list of absent students that have been reported since the first listing was made, followed by an alphabetized list of tardy students that have been reported since the first listing was produced.

Terminals in the counselor's office may override any classroom absent input with a "student present this period" input. This provides for a student that is absent from class but is in the counselor's office. The attendance office terminals may be used to re-admit students with the proper reason (unexcused, excused, or other) and to declare a student absent all day.

Daily Processing

After the end of the last period, an end-of-day report is generated. This report shows the attendance (by period) for every student that was reported absent one or more periods during the day. Included in this list are indicators showing students on probation, students with excessive absences, students with excessive tardinesses, and problem students. In addition to the above output, a list is made of all students on probation that returned to class without re-admitting through the attendance office. The program also does a daily drum update. This processor takes the daily absence information and makes it part of the permanent file. This operation is either done on request (after the end-of-day list) or, if not requested, at 9:30 p.m.

Request Processing

The request processing capability of the AAAS provides the means of communication between the operator and the computer. Whenever possible, the computer will enter the request mode and the teletype will print, DEMAND, MODE: TYPE REQUEST PLEASE. This typeout indicates that the machine is available for communication. A request may be made using any one of the following teletype keys:

A — *Add a student record*
This allows the user to add a student to the master file. The student will be inserted alphabetically in the threaded file of students, and the computer will assign the student's identification number.

C — *Change a student record*
This allows the user to change any part of a student's master file except his student number and name.

D — *Delete a student record*
This allows any student record to be deleted from the master file.

I — *Interrogate a student record*
This allows any student record to be displayed given the student number.

K — *Update teacher keys*
This allows the user to change, add, or delete any teacher key.

R — *Prepare a special report*

(1) Print a class roster: a class roster for any good teacher key will be printed out for all periods.

(2) Produce an ADA monthly report: the information necessary to prepare the attendance report for state funding is printed.

(3) List students with excessive absences: students that have been flagged as having excessive absences are printed in an alphabetical list.

(4) List students on probation: students that have been flagged as probationary are listed alphabetically.

S — *Update period schedule*
The start and end times of any period can be changed. A free period may be created as desired.

T — *Initialize a time and school day number*
At the beginning of each day, the time must be input to synchronize the computer clock and the wall clock. The time may be set any time during the day if desired.

TAPE — *Dump allocated drum to tape*
All the information stored on the drum is punched on paper tape.

(NOT TAPE) — *Dump selected drum to tape*
All the volatile fields of the student records are punched on paper tape.

U — *Update drum*
All information contained in the daily attendance data portion of the master file is moved to the permanent portion of the student file.

/ — *Cancel current input*
This allows the requested input that is currently being typed to be aborted and processing to restart at the prior requested input.

RUBOUT *Cancel prior request*
The last request will be aborted and the program will await the next request (*demand mode*).

Additional input and/or output may be required depending upon the request processor selected.

If during the operation of a request processor it becomes time to do the period processing, the request processor is aborted and must be restarted when the program returns to *demand mode.*

The AAAS has hardware and software power fail capability. If power falls below a threshhold level, the program will be interrupted, registers saved, and automatically restarted when power is restored. If the power has been off for any length of time, then the time of day must be updated.

Conclusions

The Automated Attendance Accounting System has been in operation at the John F. Kennedy High School in Sacramento since February 1971. One of the more important and interesting aspects of the task is the application of this type of technology and fabrication totally outside the aerospace industry. Here was an opportunity to conceive, design, and install a system for use by individuals totally unfamiliar with computers and their possible applications. The outstanding problem was in the articulation of just exactly what type of system was needed, or, indeed, even wanted. It was illuminating to discover the difficulties in communication between people of diverse and dissimilar disciplines, further complicated by a kaleidoscope of opinions and pre-conceived ideas. The faculty especially presented a range of mixed feelings. The operational test period has shown that there is some need for enhancement in both the software and hardware, but that the system does work and is capable of doing automatic attendance accounting. During this period, it was noted that the teacher input for all periods was less than desired. After the initial learning period was over, the percentage of all day absent students that were counted absent all periods was between 40 and 70%. The correct input of re-admits, when the student returns to class, will override this lack of integrity of absent data as far as the average daily attendance (ADA) reporting to the state is concerned; however, the individual student's absent record for each period is still in error. During the next operational test, an attempt will be made to increase the teacher input.

The AAAS will provide school officials with rapid, continuous attendance information which will satisfy the state requirements for attendance (ADA) accounting information, and, at the same time, fulfill the need for improved saving of valuable teacher time, which was previously devoted to the attendance accounting function. The system will allow the attendance officer more time for individual student attendance problems by eliminating most of the manual processing of attendance data, and by generating most of the

attendance reports automatically. The real-time accountability of each student for each period will be a valuable asset to the school administration in the smooth and tranquil operation of the school. An indirect advantage of the system is that it makes possible the implementation of a student attendance honor system. This system is desirable from the administration standpoint in that it reduces congestion at the re-admit windows, and, from the student standpoint, it gives them an added responsibility.